marked, and the spectra of the third type may be divided into four classes. In the fourth of these classes the hydrogen lines are bright instead of dark. This spectrum seems to be characteristic of the variable stars of long period when near their maximum. As stated above, it has led to the detection of several new variable stars, and has been confirmed in many of the known variables. Slight peculiarities are noticed in the spectra of many stars, so that they cannot be arranged in an exact sequence; but these deviations are not sufficient to affect the general law. The number of stars not included in the above classification is very small. A few stars like γ Cassiopeiæ, β Lyræ, and δ Centauri resemble the stars of the Orion type, but some of the lines are bright instead of dark. Stars of the fourth type, whose spectra appear to be identical with that of carbon, are not included in the above classification. Other stars, whose spectra consist mainly of bright lines, like those of the planetary nebulæ, may be included with them in a fifth class. It also appears that the position of the lines in both cases is probably identical with that of corresponding lines in stars of the Orion type." (Introduction, p. xvii.)

It would be difficult to find fault with the masterly way in which Prof. Pickering and his assistants have done their work. Our chief source of complaint, which no doubt arises more from impatience than anything else, is the lack of detail with regard to the spectra themselves. For investigations to which such a work as the Draper Catalogue should naturally lead, a mere estimation of the type of spectrum serves for little more than a determination of the relative numbers and distribution of the spectra of the various types. For the present, however, this is practically all that Prof. Pickering tells us. We are left quite in the dark, for instance, as to what is actually seen in the photographs of the spectra of stars of Secchi's fourth type, although we are informed that the photographic spectra are as characteristic as the visual. It would be interesting too, to know the differences in the sub-divisions of Secchi's third type.

All stars north of $-20°$ of the fourth magnitude and brighter have been photographed on a large scale with the 11-inch refractor, and a discussion of these will occupy a subsequent volume of the "Annals." This will be awaited with interest by all who are engaged in researches in astronomical physics.

We are delighted to find that the work of the Henry Draper Memorial is to be extended beyond the mere routine of photographing stellar spectra. "A broader field has been assigned to the Henry Draper Memorial by Mrs. Draper than was at first proposed. Instead of confining its work to the study of the spectra of the stars, their physical properties in general will be investigated. The liberal support given to it should give yet more striking results in the future than have hitherto been attained." (Introduction, p. xxiv.)

Laboratory work has already been commenced, and to aid the study of spectra in the electric arc, a 10-h.p. dynamo has been generously presented by the Edison Electric Co.

In the final chapter the Draper Catalogue is discussed with reference to the visual observations of Vogel and Konkoly. A similar comparison has already been given in NATURE, vol. xliv. p. 133, by Mr. Espin, and we need not further refer to it. We regret to find, however, that a discussion of the photographic spectra in relation to the new classification suggested by Mr. Lockyer has not been included.

It will be a source of gratification to Mr. Lockyer to find that his suggestion that stars of the Wolf-Rayet type are the first results of nebulous condensations is fully confirmed by Prof. Pickering's work. Their spectra greatly resemble those of the planetary nebulæ, the chief difference being that the characteristic nebula line near wave-length 500 is absent. This, Mr. Lockyer explains, is due to increased temperature, and this view is strengthened by the fact that the line was seen only during the later stages of the visibility of Nova Cygni. Nebulæ and bright line stars form Group I. of his classification.

So far, this is the chief point where the Draper Catalogue throws any additional light on Mr. Lockyer's views, and further discussion must be reserved until more details of the spectra are published.

The "distribution of spectra" forms the subject of chapter vii., and we gather that the stars down to magnitude 6·25 are distributed as follows among the different classes of spectra:—

Class A ...	0·61	Class K ...	0·18
,, B ...	0·02	,, M ...	0·013
,, F ...	0·12	"Peculiar" ...	0·007
,, G ...	0·05		

"According to Secchi's classification, placing Classes A, B, and F in the first type, G and K in the second, and M in the third, we have of the first type 0·75, of the second 0·23, of the third 0·01, peculiar 0·01" (p. 151).

To study the distribution in space, the sky was divided into 48 zones, and the results are thus summarised on p. 152. "It appears that the number of stars of the second and third type is nearly the same in the Milky Way as in other parts of the sky. Considering, therefore, only the stars whose spectra resemble that of our sun, we should find them nearly equally distributed in the sky. The stars of Class A, on the other hand, are twice as numerous in Region M (through which the Milky Way passes) as in Region N (an equal area away from the Milky Way), and in the case of Class B this ratio exceeds four. The Milky Way is therefore due to an aggregation of stars of the first type, a class to which our sun seems to bear no resemblance as regards its spectrum. Spectra of Class B seem to conform still more closely to the region of the Milky Way, although probably they are not sufficiently numerous to materially affect its light. The Milky Way must therefore be described as a distinct cluster of stars to which, from its composition or age, the sun does not seem to belong."

The statement that the sun bears no resemblance to stars like those which chiefly constitute the Milky Way is not quite so precise as it might be. The lines in the spectra, so far as we know them, indicate the same substances in each, and the tendency of evidence is to show that the sun is a type of what the stars of the Milky Way will become.

Not the least interesting part of the researches connected with the formation of the Draper Catalogue is that dealing with the determination of photographic magnitudes. Elaborate investigations have been carried out by Prof. Pickering with his usual skill and care, and we hope to refer to them in some detail on another occasion.

No satisfactory method of applying the slitless spectroscope to the determination of velocities in the line of sight, except in the special case of a spectroscopic binary, has yet been devised, and this branch of research must therefore be carried out in the usual way.

A. FOWLER.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

OXFORD.—We regret to notice that the Savilian Professor of Geometry (J. J. Sylvester, Hon. D.C.L.), has had to apply for leave of absence and dispensation from the performance of statutory duties on account of ill-health. Mr. J. Griffiths, Fellow and Tutor of Jesus College, will lecture on the "Recent Geometry of the Circle and Triangle" for the Professor.

At a meeting of the Hebdomadal Council, Rev. W. Inge, Provost of Worcester College, and Rev. W. W. Jackson, Rector of Exeter College, were elected to be members of the Delegacy for the Training of Teachers under the provisions of the Statute approved by Convocation, November 24, 1891; and in a Congregation holden February 23, Joseph Wells, Fellow of Wadham College, and George R. Scott, Fellow of Merton College, were likewise elected members of the same Delegacy.

In a Convocation holden on March 1, Mr. Henry Balfour, Trinity College, was appointed Curator of the Pitt-Rivers Museum, to hold office until December 31, 1898, and during that period to enjoy the same status in regard to the University Museum as the Professors teaching in the Museum, and to receive a stipend of £200 a year from January 1, 1892. The Curators of the University Chest were authorized to expend a sum not exceeding £150 a year from January 1, 1892, for seven years, on assistance and current expenses in the Pitt-Rivers Museum.

CAMBRIDGE.—Mrs. Phillipps offers to the University a sum of £2000 to found an "Arnold Gerstenberg Scholarship" in memory of her brother. The Scholarship is to be held by men or women who have passed the examination for the Natural Sciences Tripos, and intend to pursue the study of mental and moral philosophy.

A grant of £40 has been made to H. Kynaston, B.A. of King's, from the Worts Fund, to enable him to investigate the geology of the Eastern Alps in the ensuing summer.

Prof. Foster is appointed an Elector to the Downing Professorship of Medicine, to the Professorship of Zoology, and to

the Professorship of Botany; Prof. Dewar an Elector to the Professorship of Chemistry; Prof. Liveing an Elector to the Jacksonian Professorship; Prof. G. H. Darwin an Elector to the Cavendish Professorship of Physics; Prof. Sir G. G. Stokes an Elector to the Professorship of Mineralogy; Dr. J. Hopkinson an Elector to the Professorship of Mechanism and Applied Mechanics; Prof. Ray Lankester an Elector to the Professorship of Zoology; Mr. W. H. Hudleston to the Woodwardian Professorship of Geology; and Dr. Gaskell an Elector to the Professorship of Physiology.

At the Congregation on February 25, graces for the establishment of two lectureships in Agricultural Science, one of which should be held by a Director of Agricultural Studies, were rejected by 103 votes to 91. A grace for the appointment of a Syndicate to consider the question of degrees in science was rejected by 154 votes to 105. The latter was opposed by a number of the teachers in natural science, as tending to place their students in a position of isolation, and perhaps of inferiority, as compared with others.

The Rev. W. M. Campion, D.D., Fourth Wrangler in the Mathematical Tripos of 1849, and formerly an Examiner for the Mathematical and Moral Sciences Tripos, was on February 23 unanimously elected President of Queen's College, in succession to the late Dr. G. Phillips.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, February 25.—"Note on the New Star in Auriga." By J. Norman Lockyer, F.R.S.

Since my note of February 11, observations of the new star have only been possible at Kensington on seven evenings—namely, February 11, 12, 13, 16, 22, 23, and 24. The 13th and 22nd were the only two very fine nights.

The star now appears to be fading. In the photograph of the region taken on February 3, the Nova appeared to be brighter than χ Aurigæ (magnitude 5·0), but in that taken on February 23 it is not brighter than the companion to this star, which is fainter than sixth magnitude. No marked diminution in brightness was noticed before February 22.

The colour has not appreciably changed since the star was first observed.

Photographs of the spectrum were attempted on all the dates named. Those of February 11, 12, 16, and 23, however, were insufficiently exposed, but they show that the dark lines were still more refrangible than the accompanying bright ones, and that the same lines were present as in the previous photographs. A plate was exposed for 2 hours 35 minutes on February 24, but no impression was obtained. The photograph taken on February 13 is identical with those referred to in the notes which I have already communicated to the Society. In the three photographs of February 22, there appears to be a slight diminution in the intensity of the H and K lines, but otherwise there is no decided change.

There is no evidence of revolution during the twenty days of observation. In all the photographs the dark lines are more refrangible than the bright ones, and the relative velocity deduced from those of February 3, 7, 13, and 22 appears to be about 600 miles per second. As this only represents the velocity in the line of sight, we are still ignorant of the real velocities of the two bodies. The constant relative velocity indicated by the displacement of the bright and dark lines may be regarded as confirming the supposition that two meteor-swarms or comets have collided, the velocities being so great, and the masses so small, that neither was captured by the other.

The relative velocity of 600 miles per second seems at first sight to be abnormally great, but if we regard each of the component swarms as moving at the rate of 300 miles per second, the velocities are quite comparable with those of other bodies in space. The star 1830 Groombridge, for example, moves at the rate of 200 miles per second across the line of sight, and its real velocity may be much greater.

Eye observations have been made on every available occasion. The chief variation from those previously reported is the general fading of the continuous spectrum, and the consequent unmasking of the lines between *b* and D. Micrometric measures of four new lines in this region were made by Mr. Fowler on February 23 and 24. These, with the other lines observed at Kensington in the region F to C, are shown in the table which follows. The corresponding lines observed in the spectra of new stars which have previously appeared, and those in the spectra of some of the bright-line stars, are added for comparison.

Nova Aurigæ.		Nova Cygni.			Nova Andromedæ.	Nova Coronæ.	γ Argûs.	Arg.-Oeltz. 17681.	Lalande 13412.	1st Cygnus.	2nd Cygnus.	3rd Cygnus.	γ Cassiopeiæ (Sherman).	Suggested origins.
Feb. 23.	Feb. 24.	Cornu.	Vogel.	Copeland.										
656 (C)	656	661	656	656	—	656	—	—	—	—	—	—	—	H (656·2)
635	630	635	630	630	—	—	—	—	—	—	636	636	635	—
589 (D)	—	588	589	589	—	—	590	—	—	—	—	—	—	Na (589·1)
579	579	—	580	577·5	—	—	580·9	581	581	583	581	581	—	Fe (579·0)
—	570	—	—	—	—	—	—	—	—	571	570	569	—	—
566	—	563	564	—	—	—	566	—	—	—	—	564	—	C (563·5)
558	558·3	—	—	—	558	—	—	—	—	558	—	558	556	Mn (557·6)
531	531·5	531	531	—	532	—	—	—	—	—	—	—	531	—
518	517·7	518	—	—	517	—	—	—	—	—	—	517	517	C (516·5) or Mg (517·5)
500·6	500·6	500	499	502	—	501	—	—	—	—	—	—	499	Mg (500·6)
490	490·3	—	490	—	—	—	—	—	—	—	—	—	—	—
486	486·2	483	486	486	486	486	—	—	—	—	—	—	486	H (486·2)

It will be seen that all the lines of Nova Aurigæ have previously been recorded in other Novæ, or in the bright-line stars.

The complete spectrum, including the photographic region, is shown in a diagram (which was exhibited). This, and the light curve of the spectrum from F to C, were drawn by Mr. Fowler and Mr. W. J. Lockyer on February 22, and confirmed by Mr. Fowler on February 23. The 3-foot reflector and McClean spectroscope were employed in each case.

The changes which are taking place in the Nova are exactly what would be expected according to my hypothesis that new stars are produced by the collisions of meteor-swarms. The rapid fading of the star demonstrates that small bodies and not large ones are engaged, and this is further confirmed by the observed diminution in the brightness of the continuous spectrum relatively to the bright lines. If two condensed bodies were in collision, it is evident that the lines would fade first.

Chemical Society, February 4.—Prof. A. Crum Brown, F.R.S., President, in the chair.—The following papers were read:—Pedetic motion in relation to colloidal solutions, by W. Ramsay. The pedetic or Brownian motion of small particles depends (1) on the size of the particles, (2) on their density, and (3) on the nature of the medium in which they are sus-